



NEW TECHNOLOGY EQUALS NEW GALLONS

Alternative Fuels Research and Education Division ★ www.rrc.state.tx.us Click on Propane

JOHN DEERE PROPANE TRACTOR

Southwest Research Institute has completed development of a dedicated propane 74-horsepower John Deere Model 5410 tractor. The tractor was displayed May 12-15, 2002, at the national Clean Cities conference in Oklahoma City and again May 19-20, 2002, at the Texas Propane Gas Association's Southwest Trade Show in Arlington. Field demonstrations are scheduled to begin this summer in San Antonio.

Southwest and John Deere developed the tractor under grants from the Texas Alternative Fuels Council and PERC.

The engine is full-authority computer-controlled, with closed-loop fuel controls and adaptive-learn capability. These technologies are also applicable to bigger John Deere tractor engines. Emissions exceed Tier 3 (2007) U.S. Environmental Protection Agency standards, with 60 percent lower NO_x and 90 percent lower particulate emissions than a comparable diesel. Engine noise is also reduced by 50 percent.

John Deere estimates that 70 percent of the market for the LPG tractor will be in air-quality nonattainment areas like Houston, for use in highway maintenance, industrial parks, golf courses, and off-road construction. Texas, California and Oklahoma are expected to be the main initial markets for the tractor.

DCH/ENABLE RESIDENTIAL FUEL CELL

With matching \$500,000 grants from the U.S. Department of Energy and PERC, AFRED and its partners will begin work this year to develop, test and demonstrate a residential-scale (5 kW) propane fuel cell. The DOE award recognizes the outstanding work AFRED has done in fuel cells and was one of just 10 grants in this category nationwide. The team will develop an optimized HyRadix propane fuel processor, integrate the processor into a DCH/Enable fuel cell prototype, independently test performance at Southwest Research Institute, and demonstrate the unit at a Texas Department of Transportation facility in San Antonio.

Simultaneously, AFRED will undertake a market study aimed at identifying and quantifying early-entry customers, technical and regulatory requirements, and other challenges and opportunities that need to be addressed in planning commercialization of the units.

The fuel-cell grant marks an important milestone toward the Texas propane industry's goal of developing

year-round residential propane sales. The successful commercialization of a primary-power, residential fuel cell system operating on propane is expected to significantly increase annual use of propane. Today, over 500,000 Texas households use propane for home-heating systems. Successful commercialization of residential propane fuel cells is expected to increase domestic propane sales by about 1.7 million gallons annually in 2005, and by over 60 million gallons annually by 2007. Using a conservative average propane price of \$1.10 per gallon, the use of propane fuel cell systems could account for \$1.9 million in propane sales in 2005, and \$66 million in sales by 2007.

PROPANE TECHNOLOGY IN POULTRY PRODUCTION

Under a grant from PERC to study propane applications in agriculture, AFRED has worked with Wallace Manufacturing (Siloam Springs, Arkansas) and poultry husbandry experts from the University of Arkansas and Texas A&M University to evaluate heat-treating of broiler-house litter. Results to date show that while propane heat treatments cannot replace good management and sanitation, they can help eliminate or reduce disease pathogens on the floor surfaces of broiler houses and turkey barns.

This work has shown good potential to create new year-round propane load. Wallace Manufacturing's patented Bio-Burner can treat a large chicken house in less than an hour using between 20 and 40 gallons of propane. The unit is a 4' x 7' x 2' stainless steel box equipped with 6 liquid propane torches. The torches are 1,900° F., million-BTU devices that heat the litter in a broiler house to 900° F., hot enough to kill agents like *Salmonella* that make birds sick.

Dr. Susan Watkins of the University of Arkansas's Center for Excellence for Poultry Science has tested the Bio-Burner's effectiveness by counting how many germ clumps ("colony-forming units") are present in litter before and after treatment. Dr. Watkins concluded that the Bio-Burner is an effective aid in the reduction of microbial populations and can be part of an effective program for poultry and chicken-house management.

AFRED plans further tests this year with Dr. Watkins, Wallace Manufacturing and Pilgrim's Pride (Pittsburg, Texas) to establish cost data and determine the effectiveness of a modified burner designed to deliver a higher, more consistent temperature.

PRO-CON/GM PROPANE VAN

Thanks in part to the Texas Alternative Fuels Council, Texas delivery, service and shuttle fleets that use full-size vans have a clean new choice for model year 2002.

In 2001 the Council awarded ProCon, a consortium of Texas and out-of-state propane marketers concerned about air quality, a \$117,000 grant to help Quantum Technologies produce a dedicated propane General Motors full-size van. PERC and the U.S. Department of Energy also contributed funding for the project.

Starting last fall, Texas fleet operators could order propane 3/4-ton or 1-ton Express and Savana vans, with 135-inch or 155-inch wheelbases, certified to federal ILEV (Inherently Low-Emission Vehicle) standards. Emissions of carbon monoxide and nitrogen oxides are well below even the strict ULEV level.

	Savana - 120K miles	Federal CFF ULEV standards - 120K miles
NMOG	0.128 grams/mile	0.167 grams/mile
CO	0.46 grams/mile	3.7 grams/mile
NOx	0.30 grams/mile	0.8 grams/mile

Source: Quantum Technologies

LPG is stored in a two-cylinder 29-gallon tank that provides 250-mile range. LPG vapor pressure moves fuel forward toward the engine compartment. The tank is equipped with an automatic 80 percent stop-fill device and a visual 80 percent outage valve routed to the side of the van next to the fill receptacle.

Where Can I Get One?

Propane Savana and Express vans are on Texas state contract for public agencies. Others may order them through GMC Trucks of North Texas, Grapevine; Hendrix GMC, Austin; Henna Chevrolet, Austin; Hudiburg Chevrolet, Ft. Worth; La Roche Chevrolet, Brenham; Lawrence Marshall Chevrolet-Olds, Hempstead; Peters Chevrolet, Longview; and Shamrock Chevrolet, Lubbock.

PROPANE FLAME CULTIVATION

Under two grants from PERC, AFRED and its partners Mississippi State University, Texas A&M University and the University of Florida have conducted multidisciplinary research on using propane to control weeds and nematodes in cotton, sugar cane and vegetable production.

Field studies in Stoneville, Mississippi, have shown that flame cultivation can provide an effective alternative to chemicals. In addition to conventional cross row flaming, methods were developed for early flaming applications using parallel-row flaming techniques. Statistical

comparisons showed that lint yields attained in flame cultivation plots were similar to those receiving conventional herbicide applications, so flaming can substitute for chemicals in a weed management program with no change in income from crop sales.

Field studies in Weslaco, Texas, showed that flaming can be used for weed control in organic sugar cane production. Yields of flame-treated sugar cane were identical to yields using other weed-control methods. In Florida, an improved design for a propane-fueled soil pasteurizer for nematode control was tested. The tests showed increased efficiency and a reduction in soil-sterilization costs. Engineering studies at College Station, Texas, showed that insulated covered burners transfer heat more effectively than open flame burners, and prototype covered burners were designed and tested for parallel flaming. The burners shield the cash crop and allow flaming to kill weeds while the plants are only an inch or two tall.

In 2002 the team will further refine and seek to commercialize the burner hardware; extend field trials and study new cost-reduction measures on cotton in Alabama, Georgia, North Carolina and New Mexico; and begin field trials on soybeans in Mississippi and organic vegetables in California.

FUNDERS/PROJECT PARTNERS

AFRED/RRC, DCH/Enable Fuel Cell, John Deere & Co., Mississippi State University Delta Research Center, Pilgrim's Pride, Propane Promotion Consortium, Propane Education and Research Council (PERC), State Energy Conservation Office, Southwest Research Institute, Texas A & M University, Texas Alternative Fuels Council, Texas Department of Transportation, Texas Natural Resource Conservation Commission, Texas State Energy Conservation Office, University of Arkansas, University of Florida, UOP/HyRadix, U.S. Department of Energy, Wallace Manufacturing.

For more information on any of these projects, call Dr. Steve Jaeger at (800) 64-CLEAR.

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